

REMARKS

Claims 1-47 are pending in the subject application. Claims 46 and 47 have been withdrawn from consideration. In the Advisory Action after the final Office Action, the rejection under 35 U.S.C. § 102(b) has been withdrawn, however claims 1-45 remain rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,807,937 to Matyjaszewski et al. ("the '937 patent"). Applicants respectfully traverse the rejection of claims 1-45 as set forth herein.

Paragraph [0238] of the specification has been amended to correct an obvious typographical error. Specifically, the recitation of "FIG. 11b" in the specification as filed, should read "FIG. 13b". The paragraph refers to DP of the polymerization using the CuBr/Na₂EDTDA catalyst system as reported in Table 5, which corresponds to the DP values illustrated in FIG. 13b. Figure 11 contains only a single figure (no "b" figure) which is a plot of absorbance data and not DP data.

Claims 1 and 32 have been amended to further define the transition metal complex catalyst has having "sufficient solubility" and "a redox potential of less than 500 mV" as recited in claims 17 and 45. Claims 17 and 45, which depended from claim 1 or 32, respectively, have been canceled. Support for these amendments may be found in the specification as filed, for example at paragraph [0017] and the claims. Claims 1 and 32 have also been amended to further define the polymerization as having a conversion of greater than 10%. Support for this amendment may be found in the figures and specification as filed, for example in Fig. 13b, in the text of the Examples and in the various tables in the Examples, including Tables 2-5 and 7-9. No new matter is added by these amendments.

Claims 1, 16, 18, 30-32, and 44 have been amended to delete the term "suitable" before catalyst. Claims 16, 30, 31 and 44 have also been amended to delete terms now incorporated into claims 1 and 32. No new subject matter is added by these amendments.

Rejection under 35 U.S.C. § 103(a)

Claims 1-45 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the '937 patent. Applicants traverse this rejection as set forth herein.

In the Response of November 7, 2006, Applicants submitted a Declaration of Dr. Nicolay V. Tsarevsky under 37 C.F.R. 1.132. In the Declaration, Dr. Tsarevsky states that a suitable catalyst for polymerizing acidic monomers may have a combination of properties, such as, being at least partially soluble in the reaction media, possess a low redox potential, stability towards ionic species, low propensity to disproportionation, and sufficient conditional metal-radically transferable atom or group phylicity to act as a catalyst in the reaction media. A catalyst is suitable for the reaction if the interactions of the catalyst with the reaction media and the reaction components do not prevent the catalyst from being active in the desired reaction. Dr. Tsarevsky states that for acidic monomers, the exemplified catalysts of the '937 patent (bipyridine ligands and substituted bipyridine ligands) are not suitable catalysts, nor does the '937 patent teach how to select a suitable catalyst from the range of transition metal and ligand combinations described in the '937 patent. Ligands having such properties are a narrow set of ligands compared to the set of ligands described in the '937 patent and the properties are not taught in the '937 patent or elsewhere prior to the subject application.

As maintained in the telephonic interview and Response After Final Rejection filed April 24, 2007, evidence that the exemplary ligands of the '937 patent (i.e., bipyridine ligands and substituted bipyridine ligands) are not suitable for acidic monomers is disclosed in the specification of the subject application. For example, in the Comparative Examples (paragraphs [0239] to [0257] and Figures 13a and 14) copper catalysts with bipyridine ('bpy') ligands are shown to be unsuitable for catalysis of ATRP of acidic monomers in aqueous media. Figures 13a and 14 illustrate comparative reactivities of a Cu/bpy catalyst system (of the '937 patent) and a CuBr/Na₂EDTDA catalyst system of the subject application. As can be seen in these figures and the corresponding text (paragraphs [0239] to [0257]), the Cu/bpy type ligands are unsuited for ATRP of acidic monomers in aqueous systems since the acidic monomers coordinate with the metal, thereby deactivating the catalyst.

In the Advisory Action, the Examiner states that the cited figures "appear to show that the catalyst including a bpy ligand results in a polymerization which is not very effective, and the catalyst appears to be fairly rapidly deactivated," but that the

“data shows that some polymer is made prior to deactivation of the catalyst.” Applicants maintain that any polymer observed in these comparative examples are either the result of experimental error or a non-controlled polymerization process (such as an uncontrolled free radical process). For example, Example 4C indicates zero conversion for the bpy system and Example 5A demonstrates that methylacrylic acid deactivates the Cu(I)/bpy catalyst. However in an effort to move the claims toward allowance, Applicants have amended claims 1 and 32, herein, to recite “wherein the polymerization has a conversion of at least 10%”. In the comparative examples using bpy as a ligand, the observed polymerization conversion was a maximum of 8.9%, even after 43 hours (see page 18, Table 6, third entry, of the published application). In contrast, polymerizations of acidic monomers in aqueous systems using the claimed processes result in conversion values of greater than 10% and ranging up to at least 82.6% (see table prior to paragraph [0220] in the published application). In the Advisory Action, the Examiner indicates that the claims are “open-ended regarding ... the overall effectiveness of the catalyst”. The amended claims indicate that the claimed catalysts are more effective for acidic monomers in aqueous system than the exemplary catalysts disclosed in the ‘937 patent. Applicants note that values such as degree of polymerization are dependant on the conversion and ratio of monomer to initiator, and higher degrees of polymerization would also be observed for the claimed processes.

Applicants have established that exemplary catalysts of the ‘937 patent are not suited for catalysis of atom transfer processes of acidic monomers in aqueous media. Further, determining the necessary parameters for a catalyst suitable for controlled polymerization of an acidic monomer in aqueous media are not disclosed or taught by the ‘937 patent. The subject application sets forth properties and methods for determining ligand/catalysts complexes that are suited for atom transfer processes of acidic monomers in aqueous media. One skilled in the art would not find these properties obvious from the disclosure of the ‘937 patent. Therefore the processes of claims 1-45 are non-obvious over the disclosure of the ‘937 patent. Applicants respectfully request withdrawal of the rejection under 35 U.S.C. § 103(a).

CONCLUSION

Applicants submit that claims 1-45 of the subject application recite novel and non-obvious polymerization processes for forming polymers from acidic monomers. Applicants respectfully request that the Examiner consider the Amendments and Remarks submitted herein and Applicants respectfully submit that all claims in the subject application are in condition for allowance. Accordingly, reconsideration of the rejection and allowance of all pending claims is earnestly solicited.

If the undersigned can be of assistance to the Examiner in addressing issues to advance the application to allowance, please contact the undersigned at the number set forth below.

Respectfully submitted,


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